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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference PC452GQ	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/EP 03/09542	International filing date (day/month/year) 28.08.2003	Priority date (day/month/year) 29.08.2002
International Patent Classification (IPC) or both national classification and IPC H02K19/10		
Applicant C.R.F. SOCIETA CONSORTILE PER AZIONI		

- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 6 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of sheets.

- This report contains indications relating to the following items:
 - I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV ☐ Lack of unity of invention
 - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain documents cited
 - VII ☐ Certain defects in the international application
 - VIII ☐ Certain observations on the international application

Date of submission of the demand 24.03.2004	Date of completion of this report 31.08.2004
Name and mailing address of the International preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Zanichelli, F Telephone No. +31 70 340-3357 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/EP 03/09542**

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-54 as originally filed

Claims, Numbers

1-26 as originally filed

Drawings, Sheets

1/30-30/30 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:
- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY
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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-26
	No: Claims	
Inventive step (IS)	Yes: Claims	1-26
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-26
	No: Claims	

- 2. Citations and explanations**
see separate sheet

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

- D1: US-A-5 818 140 (VAGATI ALFREDO) 6 October 1998 (1998-10-06)
- D2: US-B-6 239 526 (JUNG DAL HO ET AL) 29 May 2001 (2001-05-29)
- D3: US-A-5 801 478 (NASHIKI MASAYUKI) 1 September 1998 (1998-09-01)
- D4: US 2001/048264 A1 (TRAGO BRADLEY A ET AL) 6 December 2001 (2001-12-06)

1. The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and shows (the references in parentheses applying to this document, fig 5):
 - a synchronous electric machine consisting of an inductor (S) provided with a winding and having, for each pair of poles (N, S) of the armature (R), n identical ferromagnetic tooth structures and n slots (C), alternating with one another and each having at the air gap (T) a respective, essentially constant, extent in the direction of relative displacement between inductor (S) and armature (R);
 - the surface of the armature (R) facing the air gap (T) is divided into elements or samples (the spaces between the points Pr and Pv) having substantially the same extent in the said direction of relative displacement;
 - each sample of the armature (R) having a respective magnetic potential value essentially constant over the extent of the sample;
 - each sample of the armature (R) being associated with a respective total value of magnetic permeance at the air gap (T);
 - the armature (R) includes a plurality of magnetically distinct bodies (M1-M4) of ferromagnetic material, each of which couples at least two armature samples in such a way as to ensure a substantial magnetic equipotentiality.
2. The subject-matter of claim 1 differs from this known synchronous electric

machine in that (the references refer to the application):

- each of the said ferromagnetic tooth structures of the inductor (B) has at the air gap a sequence of teeth (20a) of substantially constant extent along the direction of relative displacement, separated by at least one dummy slot (21a) so that the surface of the inductor (B) for each pair of poles has at the air gap overall N teeth (20a) separated by N intervals, (N being an integer multiple of n) of which n are constituted by the openings to the air gap of the said n slots and (N-n) are constituted by the openings to the air gap of the said dummy slots (21a);

The subject-matter of claim 1 is therefore novel (Article 33(2) PCT).

3. With respect to inventive step, the above mentioned distinguishing features result in an improved torque ripple cancellation.
 - 3.1. The technical problem to be solved may therefore be regarded as how to further reduce the torque ripple in a machine (like the one described in D1) with the rotor subdivided into elements or samples.
 - 3.2. Document D3 shows a rotor of the same type of the one disclosed in D1. This rotor could therefore be considered as implicitly consisting of virtual samples (like the samples between the points Pv in document D1). Furthermore, in figure 19, document D3 shows dummy slots in the stator poles.
However no relationship between number of slots (real and dummy) and number of virtual samples is given nor even hinted.
 - 3.3. Document D4 discloses typical dummy slots (denoted at 26, 36) used in brushless machines, but the rotor does not consist of samples.
 - 3.4. D2 (like D1) has a discretized rotor like the machines in the application but does not have dummy slots and solve the problem of reducing torque ripple by varying the size of the rotor samples.
 - 3.5. In conclusion none of the prior art documents cited in the search report appears to teach, or comprise hints that would lead the skilled man towards the solution defined by the features of claim 1 mentioned here above at point 2.

Thus, the subject matter of claim 1 also involves an inventive step (Article 33(3) PCT).

4. The industrial applicability of claim 1 is beyond any doubt (Article 33(4) PCT).
5. Claims 2-26 are dependent on claim 1 and as such also meet the requirements of Articles 33(2), 33(3), 33(4) PCT.
6. It is noted that the application contains some non-major clarity problems.